NON-PUBLIC?: N
ACCESSION #: 9107080041
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Brunswick Steam Electric Plant Unit 2 PAGE: 1 OF 05

DOCKET NUMBER: 05000324

TITLE: Manual Reactor SCRAM Due to Failure of Safety Relief Valve "G" to Close During Start-up Testing
EVENT DATE: 03/13/90 LER #: 90-004-03 REPORT DATE: 07/01/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 2 POWER LEVEL: 007

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: AD COMPONENT: RV MANUFACTURER: T020
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 0536 on March 13, 1990, a manual scram was initiated due to the failure of safety/relief valve (SRV) B21-F013G to close during startup testing. Reactor power was approximately 7% and reactor pressure was approximately 250 psig. The 11 unit SRV's were being cycled in accordance with plant procedures to verify operability per Technical Specification 3.5.2. Ten of the eleven SRV's had been successfully tested prior to this failure. A normal scram recovery was conducted per plant procedures and no automatic safety actuations or isolations occurred. The investigation determined that the solenoid valve which allows remote manual operation of B21-F013G was inoperable. The solenoid would allow the SRV to be opened, but would not allow timely closure of the SRV. The solenoid valve was replaced, the unit returned to the required testing conditions and the SRV was successfully tested. The solenoid valve was sent to Wyle Laboratory and the root cause was

determined to be failure of the solenoid disc to properly realign with its seat after de-energization. The report indicated that a potential cause was "dirt" embedded in the rubber pad located on the backseat. An investigation into the source of the material was conducted. A contamination source was not found and the investigation concluded that the instrument air system does not have a generic problem with contamination. The air monitoring program developed in response to GL 88-14, the recently installed pneumatic nitrogen systems on each unit, and the manufacturer's development of a more durable solenoid for future installation decreases the potential for a reoccurrence of this event. No further corrective actions are planned. This event had minimal safety significance as the Unit is analyzed for a stuck open SRV at 100% power.

END OF ABSTRACT

EVENT:

A Unit 2 manual reactor scram during safety relief valve (SRV) testing due to the failure of SRV B21-F013G to close.

INITIAL CONDITIONS:

Unit 2 was at approximately 7% power and at 272 psig performing startup testing following a refueling/recirculation piping replacement outage. Manual cycling of the SRV's was being performed in accordance with plant procedure Periodic Test (PT) 11.1.2. This test manually cycles each valve open and closed to verify valve operability. Ten of the eleven valves had been successfully tested, with only B21-F013G remaining to be tested.

EVENT DESCRIPTION

At approximately 0500 on March 13, 1990, SRV test PT-11.1.2 was initiated to verify SRV operability. This testing is performed following each refueling outage per Technical Specification 3.5.2, by opening each valve from the control room using the remote manual control switch (one at a time), verifying steam flow, and then shutting the valve from the control room. The first ten valves were successfully cycled between 0500 and 0534.

At 0535, SRV B21-F013G was opened from the RTGB, steam flow was verified, and the switch was placed in the "close" position. The Control Operator (CO) noted that the valve did not go closed and cycled the valve several times in accordance with Abnormal Operating Procedure (AOP)-30,

Safety/Relief Valve Failure. These attempts failed to close the valve and at 0536, a reactor scram was manually inserted in accordance with AOP-30. At approximately 0537, SRV B21-F013G closed at a pressure of approximately 230 psig. A normal scram recovery was conducted per Emergency Operating Procedures Path 2, Low Power Scram. During this event, the maximum indicated pressure was 279 psig and the level was maintained between 172 inches and 193 inches (normal 182.5-192.5 inches). There were no automatic challenges to any safety systems and level was maintained using the feedwater system.

EVENT INVESTIGATION

Following the event, an investigation was initiated to determine the cause of the B21-F013G failure to close on a "close" signal from its remote manual control switch. Initial troubleshooting centered on the solenoid valve (Target Rock Model 1/2 SMS-A-01-1) used to port air to the pilot assembly for remote manual operation. The solenoid valve was removed from the SRV and taken to the maintenance shop for investigation by plant maintenance and technical support personnel.

Troubleshooting activities began by developing a testing methodology. A new spare solenoid valve was obtained from stock and hooked up to a test rig. Test conditions simulated the installed conditions as near as possible, including a

125 VDC power source and an air supply of approximately 113 psig. Air pressure was applied to the inlet port of the test solenoid and no leakage was identified. When power was applied to the solenoid coil, the solenoid valve repositioned, allowing air to enter the test volume (simulating the SRV opening). Power was then removed from the coil and the solenoid valve repositioned again, venting air from the test volume. If this had been installed on an actual SRV, this venting of the air pressure would have allowed the spring pre-loading to close the SRV. This test was conducted four times to verify test repeatability.

Following verification of the testing methodology, the solenoid removed from SRV B21-F013G was connected to the test rig. The first observation noted was a leak from the exhaust port when air was applied to the solenoid. The solen
id coil was then energized and the solenoid valve repositioned, allowing air to enter the test volume (simulated valve opening). Air leakage was still noted around the exhaust port, but the leakage did not appear to be affecting the testing. Following verification that the solenoid correctly repositioned to the "open"

position, power was removed from the solenoid coil. No immediate change was observed. The leak at the exhaust port continued and the pressure in the test volume slowly decreased. This test was also performed several times with the same results. Based on this testing, it was determined that the solenoid was the cause of the failure of SRV B21-F013G to close.

The solenoid valve which was removed from the SRV was shipped to Wyle Laboratory for inspection and root cause determination. The root cause investigation was conducted by Target Rock with assistance from Wyle and Carolina Power & Light. Initial test results confirmed the results found at BSEP in that, the solenoid would open but would not reseat correctly. The inability to reseat was attributed to the disc not realigning with its seat properly after de-energization. A visual inspection showed that "dirt" was embedded in the rubber pad located on the backseat and that loose "dirt" was also found in the vicinity. Per the Target Rock personnel performing the inspection, the debris found in the solenoid was "dirt" and not metal shavings, chips, etc... The solenoid was cleaned out and the dirt disposed of; therefore, it is not available for analysis. A search of SRV work requests was made to determine if this was a repetitive failure problem and no other similar failures were identified.

CORRECTIVE ACTIONS

The solenoid valve for SRV B21-F013G was replaced and the unit was restarted and returned to test pressure (approximately 250 psig) where the SRV was successfully tested. (See: 2-90-004-03 Supplemental Information)

EVENT ASSESSMENT

Unit 2 is analyzed for a stuck open SRV at 100% power which fails to shut, therefore this event is bounded. The testing in progress when this failure occurred is designed to assure SRV operability prior to reaching high power levels where one or more SRV failures could create a more significant event. As such, operation within the analysis was assured. The testing met its purpose and the event had minimal safety significance.

2-90-004-03 SUPPLEMENTAL INFORMATION

EVENT INVESTIGATION

In response to GL 88-14, Unit 2 instrument air sampling data was

collected (ie; prior to this event). A review of data collected on October 16, 1989, from the most representative point available, did not indicate that significant debris was present in the instrument air line at the time of the collection. SRV pilot solenoid maintenance history was also reviewed for indications that past failures may have been caused by instrument air contamination. No evidence of previous problems of this kind were found. The air systems are identical on each Brunswick Unit and the Unit 1 SRV pilot solenoids are subject to similar air quality conditions as the Unit 2 SRV pilots. On December 21, 1990, two Unit 1 SRV pilot solenoids were removed from service and disassembled. The involved pilot solenoids were specifically chosen because they are located on two separate main steam lines on opposite sides of the drywell and are two of the first three SRV's to be manually operated when required. No debris was found in either of the solenoids; each appeared clean and showed no signs of wear. On January 17, 1991, the Unit 1 instrument air supply lines were blown down and minute quantities of debris were collected. The volume of debris collected was so small that it was impractical to measure its volume. The debris was determined to consist of a gritty/sandy substance and there was no evidence that the small specimen of debris was metallic or a corrosion product. It is thought the debris entered the air lines while sample connections were open.

A contamination source has not been found and the investigation concluded that the instrument air system does not have a generic problem with contamination. The potential for future contaminations and similar events is low because of recently installed instrument air nitrogen pneumatic supply (PNS) systems on each unit and increased instrument air monitoring in accordance with the program developed in response to GL 88-14. Additionally, the solenoid manufacturer has replaced this type of solenoid with a type less susceptible to air system contamination. This more durable solenoid will by procured for future installation as the original stock is depleted.

CORRECTIVE ACTIONS

The GL 88-14 air monitoring program, PNS and future installation of the more durable solenoids decreases the potential for a reoccurrence of this event. No further corrective actions are planned.

EIIS

System/Component Code

Safety Relief Valve AC/RV
Feedwater SJ
Solenoid Valve AC/V
125 VDC Power EI
Air Supply LD
Pilot Assembly None Found
Reactor Scram JC
Steam Flow FI
PNS LK

CP&L

CP&L Carolina Power & Light Company
Brunswick Nuclear Project
P. O. Box 10429
Southport, N.C. 28461-0429
July 1, 1991

FILE: B09-13510C 10CFR50.73

U.S. Nuclear Regulatory Commission
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Washington, D. C. 20555

BRUNSWICK STEAM ELECTRIC PLANT UNIT 2
DOCKET NO. 50-324
LICENSE NO. DPR-62
SUPPLEMENT TO LICENSEE EVENT REPORT 2-90-004

Gentlemen:

In accordance with Title 10 of the Code of Federal Regulations, the enclosed Supplemental Licensee Event Report is submitted. The original report fulfilled the requirement for a written report within thirty (30) days of a reportable occurrence and was submitted in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,

J. W. Spencer, General Manager
Brunswick Nuclear Project

TMJ/

Enclosure

cc: Mr. S. D. Ebneter
Mr. N. B. Le
BSEP NRC Resident Office

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